UHT TREATED 100 % NON-DAIRY WHIPPING CREAM

Field of the invention

[0001] The invention relates to a UHT treated whippable oil-in-water emulsion storable up to 20 °C that has a very high overrun and/or shape stability and/or texture stability, preferably with a fat phase that is fully hydrogenated vegetable oil with less than 2 % of trans fatty acids, no dairy products or any other proteins being used in said oil-in-water emulsion.

Background of the invention

[0002] All over the world there is a high demand for whippable oil-in-water emulsions that after being whipped show a very high overrun (350 to 400 %, also referred to as an overrun of 3.5 to 4) and shape stability for making decorations on cakes and for using as filling or topping on all kind of desserts. Moreover these whipped products are expected to have a very smooth texture that is preserved in time.

[0003] Products with the above-described properties do exist, see for instance US patent US6,117,473. However, products now on the market are vegetable whipping creams that are pasteurized and need to be frozen immediately after production. This frozen storage and transport involves an expensive and complicated logistic chain to the customer.

These creams may or may not contain dairy products. The latter function as emulsifier and in some cases are added to have a nicer taste.

[0004] To eliminate the whole frozen transport and storage chain, UHT treated creams have been developed, which can be stored at ambient temperature. However, these creams do not have the desired stability, texture and mouthfeel.

Aims of the invention

[0005] It is an aim of the invention to provide a non-dairy whipping cream with the properties of a pasteurized vegetable whipping cream but which is storable at room temperature.

[0006] It is another aim of the invention to provide a UHT treated non-dairy whipping cream having otherwise the properties of a pasteurized product.

[0007] It is a further aim of the invention to provide such whipping cream with high shape stability after whipping and with the right texture.

[0008] It is still a further aim to provide such creams that follow recent trends in food consumption, demanding products free of any dairy or protein source and with less than 2 % of trans fatty acids.

Description of the figures

[0009] The figure 1 represents the surface texture of a product with reference score 1.

[0010] The figure 2 represents the surface texture of a product with reference score 6.

Summary of the invention

[0011] The present invention relates to an UHT treated non-dairy vegetable oil-in-water emulsion for whipping with a very high shape stability after whipping. Said stability corresponds to a shape stability index of 55-60 or higher as indicated in table 4.

[0012] The present invention further relates to an UHT treated non-dairy vegetable oil-in-water emulsion for whipping to give a whipped product that has at least a very good surface texture as indicated in table 5. Said surface texture of said whipped product corresponds to an average score of 5 to 6.

[0013] The emulsions of the present invention have an overrun of at least 3.5.

[0014] A product according to the invention has a high shape stability after whipping and/or has a very good surface texture and/or has an overrun of at least 3.5. A preferred product of the invention combines these three aspects.

[0015] Preferably the non-dairy whipping creams contain less than 2 % of trans fatty acids, are free from any dairy product or derivative and free from any protein source. Since they are UHT treated, they are storable at temperatures up to 20 °C. A most preferred product according to the invention combines the above aspects with a high shape stability after whipping, a very good surface texture and an overrun of at least 3.5.

[0016] Emulsifiers may be selected from the group consisting of polyglycerol esters, diacetyl tartaric acid esters of mono- and/or diglycerides, lactic acid esters of of mono- and/or diglycerides sodium stearoyl lactylate, lecithin, polysorbate 60 or 80, sorbitan monostearate,

monoglycerides and/or may be any combinations thereof, the total concentration being between 0,3 and 1,2 %.

[0017] Stabilizing agents may be selected from the group consisting of guar, locust bean gum, xanthane, carageenan, cellulose derivative, sorbitol and/or combinations thereof, the total concentration being between 1,2 and 2,5 %.

[0018] In an embodiment of the invention, the non-dairy whipping cream according to any of claims 1-9 whereby the fat content is between 20 and 30 % and the sugar content between 10 and 25 %.

[0019] The invention further relates to a method to prepare a whipped product from a non- non-dairy whipping cream as described above. If whipping is done on a Kenwood Major Classic, the wipping is done at speed 1 to 2 during 30 seconds to 2 minutes, then at speed 3 to 5 until optimal consistency is reached and then possibly at low speed (speed 1 to 2) during 1 minute.

[0020] The invention further relates to whipped toppings obtainable with such methods according to claim 11 or 12, highly suitable for use in food product.

[0021] Because of their shape stability and very good surface texture after whipping the creams of the invention are highly suitable for making any decorations, toppings, fillings and the like. The invention thus also concerns the use of a non- non-dairy whipping cream of the invention in or on any food product and any food product decorated with a whipped topping prepared from a cream (oil-in-water emulsion) of the invention.

Detailed description of the invention

[0022] The present invention is related to an oil-in-water type emulsion for a non-dairy whipping cream, having an excellent emulsion stability, a high overrun after whipping and/or an extremely well shape stability including e.g. smooth texture and high texture stability after whipping.

[0023] These characteristics that are unique for UHT treated non-dairy vegetable creams are the result of a well balanced equilibrium between emulsifiers, gums and cellulose derivatives.

[0024] As mentioned above, the product is treated by UHT and as such is storable at ambient temperature (up to 20°C). As such, the new product combines positive functional properties from both pasteurized and UHT non-dairy creams. This means that the invention concerns a product storable up to 20 °C for up to 8 months with a high overrun (e.g. 350 %) and a stability after whipping suitable for making any decorations, toppings, fillings, … The product can easily be whipped until desired consistency without losing water after application.

[0025] The product of the present invention does not contain any dairy or protein source like sodium caseinate, milk powder, etc. This characteristic is found back in ready-to-use foams (e.g. US patent 6,117,473), but hitherto did not exist for UHT treated non-dairy emulsions that are to be whipped after storage of several months at ambient temperature.

[0026] Stability after whipping, texture and mouthfeel are very important characteristics for an acceptable whipping cream. International patent application WO98/31236 concerns the stability and mouthfeel of whipped

products. The lack of milk and/or protein derivatives is exceptional for UHT-treated products because milk proteins e.g. account for a large part of the emulsion and shape stability of a UHT whipping cream. Where classic vegetable creams usually are called non-dairy creams to indicate the absence of animal fat despite the presence of milk proteins (caseinates, milk powder, buttermilk, …), the product of the present invention is said to be 100 % non-dairy because there is total absence of any animal source (no animal fat and no animal proteins). In fact it is free from any protein source.

[0027] The vegetable fat that is used in a preferred embodiment of the invention is a hydrogenated palm kernel oil (composed mainly of C12:0) that is characterized by a trans fatty acids content of less than 2 %. Pasteurized products on the market generally contain partly hydrogenated fats containing more than 2 % of trans fatty acids. In a most preferred embodiment the fat blend of a product according to the invention comprises a fat blend as given in table 2. The blend contains mainly fatty acids of lauric origin (C12).

[0028] In contrast to the existing pasteurized products, there is not only a storage difference, but also a clear difference in viscosity of the emulsion which makes it easier to work with. Another advantage is that because of this difference in viscosity less product will stay in the packaging after emptying. Despite these lowered viscosity, the product has got minimal separation in the packaging as will be demonstrated below.

[0029] The invention will be further described in details in the following examples and particular embodiments by

reference to the enclosed drawings, which are not in any way intended to limit the scope of the invention as claimed.

Raw materials

[0030] The ready-to-whip food products according to the present invention include microbiologically stable oil-in-water products that can be stored as such at ambient temperature (up to 20°C). Such products include but are not limited to whipped toppings, bakery fillings, etc. The products according to the invention contain from about 20 to 30% of fat, such as fully hydrogenated, partially hydrogenated or non hydrogenated fat; from about 10 to 25% of sweetener, such as powdered/granular saccharide materials or syrup; and minor but effective amounts of stabilisers, emulsifiers, salt, flavouring and colouring agents.

[0031] According to a preferred embodiment, the fat used in the whipped foods is vegetable fat of lauric origin, fully hydrogenated and subsequently refined for human consumption. The hydrogenated vegetable fat should preferably have a melting point of 35 to 45°C, preferably close to 37°C. The vegetable fat of the whipped food products of the present invention preferably contains less than 2 % of trans fatty acid. As an example, table 1 and 2 illustrate the SFC (solid fat content) profile and free fatty acid composition of a fat that is suitably for use in a product falling under the scope of the present invention.

Table 1: SFC of vegetable oil

T (°C)	SFC (%)
10	90-98
20	75-87
30	30-45
35	5-13

Table 2: FFA composition

Nature	% of the total of free fatty acids
C 8 - caprilic acid	2 - 5
C 10 - caprinic acid	3 - 5
C 12 - lauric acid	44 - 51
C 14 - mirystic acid	15 - 17
C 16 - palmitic acid	7 - 10
C 18 - stearic acid	23 - 29

[0032] The sweeteners used in the whipped foods of the present invention consists of one or more sugars, such as fructose, sucrose, dextrose and/or syrup. This list is not exhaustive and may contain other sweetening carbohydrates and sugar alcohols or combinations with artificial sweeteners. Those components may be granulated or powdered.

[0033] The addition of this kind of sweeteners in the formulation will increase the dry matter content of the product and also provides body to the foam structure which will directly influence the stability of the whipped product. The addition of sweeteners is also used for taste purposes.

[0034] The stabilisers used in the whipped foods of the present invention are polysaccharides, made of natural or synthetic hydrocolloids, for example alginate, carageenan, locust bean gum, guar gum, xanthan gum, micro-crystalline cellulose, carboxymethylcellulose, sorbitol and other food grade carbohydrates.

[0035] The function of stabilisers in the whipped foods of the present invention is attributed to their water-binding capacity by forming a three dimensional network

throughout the system. In this way, they improve the mix viscosity, emulsion stability, air incorporation during and after whipping, body, texture and shape stability. The amount of stabilisers may be comprised from about 1 % to 4 %; preferably from 1,2 to 2,5 %.

[0036] The use of HLB (Hydrophilic Lipophilic Balance) values is recommended as a guide for selecting emulsifier systems, especially for foods as whipped toppings that must retain their emulsified character during a long shelf life. As a rule of thumb, oil-in-water emulsions are stabilised by HLB values in the range of 11-15.

[0037] The emulsifiers used in the whipped foods of the present invention may be non-ionic or ionic emulsifiers, which are defined by the HLB value of the respective emulsifiers. The ionic emulsifiers may be one or more emulsifiers each having an HLB of minimum 10, such as sodium stearoyl lactylate, polysorbate 60 or 80, sucrose monostearate, etc. The non-ionic emulsifiers may be one or more emulsifiers each having an HLB of maximum 10, such as glycerol monostearate, propylene glycol monoester, distilled monoglycerides, etc.

[0038] The function of the emulsifiers in the whipped foods of the present invention is to induce the formation of a stable emulsion and improve the rate of the aeration obtained upon whipping. The amount of emulsifiers may be comprised from about 0,2 % to 2 %; preferably from 0,3 to 1,2 %.

[0039] Many types of salts may be used in the whipped foods of the present invention for flavouring and/or stabilisation, including sodium chloride, sodium or potassium citrates, phosphates, chlorides, etc. The amount

of salts may be comprised from about 0,05 % to 1 %; preferably from 0,1 to 0,3 %.

[0040] Many types of flavouring agents may be used in the whipped toppings of the present invention, such as vanilla, cream flavour, milk flavour, etc. The flavouring agents may be natural, natural identical and/or artificial.

[0041] Colouring agents may also be included in the whipped food products of the invention.

Process

[0042] An important characteristic of toppings under the scope of the invention is the "storability at ambient temperature". This achievement was only possible through sterilisation of the product by UHT instead of pasteurisation. Both processes are identified by their specific temperature time combination as illustrated in the table below.

Table 3: Process parameters for UHT and pasteurization treatment

	UHT	Pasteurization
Temperature	135-150 °C	75-85 °C
Time	2-4 s	1-3 min

[0043] The other process steps employed to produce the vegetable cream of this invention are conventional in nature. The ingredients are dispersed or solubilised in two separate tanks, respectively an oily phase tank (vegetable oil, emulsifiers, colouring agent) and an aqueous phase tank (water, sugar, stabilisers, flavors, salts). After blending while heating to 65 °C, the two phases are mixed together.

After UHT sterilisation, homogenisation and cooling to below 15 °C, the product is fed to filling equipment, being a Tetrapak or Bag-in-Box machine.

Quality parameters

[0044] For measuring quality parameters, two new methods have been developed. The first method is a method for measuring shape stability. This stability is very important for decoration applications. The second method describes a way of measuring the surface texture of the whipped cream. As is well known to those skilled in the art, a smooth surface of a topping or decoration is very important for the final quality of the cake, dessert, … Overrun and syneresis measurement were performed via routine methods that are only briefly explained.

Measuring shape stability

[0045] UHT products to be analyzed are whipped between 7 and 9 °C. Pasteurized products to be analyzed are whipped between 5 and 8 °C. Whipping was done here by a Kenwood Major Classic at speed 2 during 1 minute and then at speed 3 until optimal consistency is reached. This way of whipping is used for all quality parameters to be determined and is an important factor when comparing or evaluating whipped cream characteristics.

[0046] An iron cylinder with a diameter of 65 mm and a height of 65 mm has been used in the shape stability tests. The inner wall thereof is covered with a removable plastic liner (used for cakes and bavarois) of 210 * 65 mm. The cylinder with the liner is put on a small, hard, flat plastic plate. The cylinder is filled to the top with the whipped product to be analyzed. Absolutely no air zones are

allowed to be included in the cylinder. With a pastry pallet the upper surface of the "cream-cylinder" is flattened. Firstly the iron cylinder is removed and afterwards the plastic liner is also removed very carefully. The plastic plate with the remaining "cream cylinder" is put in a fridge between 4 and 8 °C.

[0047] After 20 hours, the plate is then removed from the fridge. The distance between the plastic plate and the lowest point of the upper surface of the "cream cylinder" is measured. This distance defines the shape stability of the whipped topping.

[0048] The measured height gives a figure between 0 and 65: the shape stability index. Depending of this figure, the shape stability is said to be perfect, very high, high, average, low or very low. See table 4 for this scale

Table 4: shape stability expressed as a figure

Shape stability index	Shape stability
60-65	Perfect
55-60	Very high
50-55	High
45-50	Average
40-45	Low
<40	Very low

Measuring surface texture

[0049] The aerated structure of the whipped product is studied by means of a comparison with reference pictures that are prepared according to the method described below.

[0050] UHT products to be analyzed are whipped between 7 and 9 °C. Pasteurized products to be analyzed are whipped between 5 and 8 °C. Whipping is done by a Kenwood

Major Classic at speed 2 during 1 minute and then at speed 3 until optimal consistency is reached.

[0051] For analyzing the surface texture of the whipped product an overhead slide is put on a dark dish. On the overhead slide is put a metal hollow cylinder with a height of 4 cm and a diameter of 16 cm. After whipping, the hollow cylinder is filled so that at least the whole volume of the cylinder is completely filled with whipped cream and no air zones are included. Then a solid smooth metal slat with a length of > 20 cm, a height of 2 cm and a width of 3 mm is used to flatten the cylinder surface by removing the surplus cream. This is done by a manual perpendicular striking movement with the metal slat where the 3 mm side is in contact with the whipped product. This movement is done twice in opposite directions.

[0052] When so far, a digital picture is taken from a distance of about 20 cm under an angle of about 22,5 ° with a Kodak DX3500 against a dark background. This digital picture is compared with a series of reference pictures that each have a score from 1 (rough surface with many air bubbles, see figure 1) to 6 (smooth surface with almost no air bubbles, see figure 2) by at least 10 objective persons. Afterwards an average score is calculated. Depending on the score (score = score of the picture that resembles the most) given to the product to be analyzed, the surface texture is said to be perfect, very good, good, average, bad or very bad. See table 5 for this scale. Figures 1 and 2 represent respectively a whipped product with rough surface containing many air bubbles (average score 1) and with a smooth surface almost void of bubbles (average score 6).

Table 5: surface texture expressed as a figure (average score)

Average score	Surface texture
6	Perfect
5	Very good
4	Good
3	Average
2	Bad
1	Very bad

Measuring overrun

[0053] The overrun of the resulting whipped cream is a value obtained from the following formula: "100/A" (wherein A is the weight of 100 ml of whipped cream).

Measuring syneresis (loss of water)

[0054] To measure syneresis, 50 g of the whipped product is put in a propylene buchner-filter on a graduated cylinder and incubated in an isothermic room at 20 °C. After 20 hours, the quantity of liquid in the cylinder is measured in mm. This is a measure for the syneresis of the whipped product.

Examples

[0055] An oily phase and an aqueous phase having the respective formulations as shown in table 6 below were prepared separately and then mixed together at 65 °C. The emulsion was sterilised at 150 °C during 4 s, homogenized in a homogenizer (200 bars) and cooled by tubular heat exchangers to below 15 °C to obtain an oil-in-water emulsion.

Table 6: possible recipe

Phase	Component		Formulation (wt%)
Oily phase	Oil	Hydrogenated palm Kernel Oil	24
	Emulsifiers	Sodium stearoyl lactylate	0,3 - 0,8
		Lecithin	
		Sorbitan monostearate	
		Diacetyl tartaric acid esters of mono- and diglycerides	
Aqueous phase	Water	Water	54
	Emulsifiers	Polysorbate 60	0,05 - 0,3
	Stabiliser	Sorbitol	2 - 4
	Other stabilisers	Cellulose derivative	0,1 - 0,5
		Locust bean gum / Guar gum	
		Xanthane	
		Caragheenan	
	Sweeetener	Sugar	15 - 24
	Salts	Salt	0,05 - 0,3
	Flavouring		0,1 - 0,3

*Concentrations of raw materials can vary inbetween the given ranges in function of the type of product, desired characteristics and/or specific markets to which the product is destinated

[0056] After cooling down in the fridge to 7 °C, the product was whipped on the Kenwood Major Classic at speed 2 for 1 minute, then at speed 3 for 5 minutes and then at speed 1 for 1 minute. The overrun, texture, shape stability and syneresis are shown in table 8 and were measured as explained above.

[0057] For comparison with existing products, a standard UHT and pasteurized product are also subjected to

the same quality control (see table 8). The general composition of these products (as declared on the packaging) is shown in table 7.

Table 7: declared composition of standard UHT and pasteurized products.

Components	**UHT product**	**Pasteurized product**
	Hydrogenated vegetable fat	Partially hydrogenated vegetable fats
	Water	Water
Sweeteners	Sugar	Sugar
		Glucose syrup
Emulsifiers	Lactic acid esters of mono- and diglycerides of fatty acids	Polysorbate 60
	Sodium caseinate	Sorbitan monostearate
	Lecithin	Lecithin
		Sodium stearoyl lactylate
Stabilisers	Sorbitol	Sodium alginate
	Microcrystalline cellulose	Modified cellulose
Colouring agents	β-carotene	
Salts	Salt	Salt
	Sodium citrate	
	Sodium phosphate	
Flavours	Flavouring	Flavors

Table 8: Quality parameters of a product of the invention (example) compared to standard UHT and Pasteurized (Pasto) products

Product	Separation (mm)	Whipping T (°C)	Overrun (%)	Texture	Shape stability	Syneresis (ml)
Example	0,5	7	3,8	"Very good"	"Very high"	0
UHT	1	7	3,4	"Average"	"Average"	2
Pasto	0	7	3,9	"Very good"	"Very high"	0